

CLAIMS

What is claimed is:

- 1 1. A process for preparing conjugated diene polymers comprising the step of:
2 polymerizing conjugated diene monomers in the presence of a
3 catalytically effective amount of a catalyst composition that is formed by
4 combining:
 - 5 (a) an iron-containing compound;
 - 6 (b) a hydrogen phosphite; and
 - (c) an organoaluminum compound.
- 1 2. The process of claim 1, where the molar ratio of the organoaluminum
2 compound to the iron-containing compound is from about 1:1 to about 100:1.
- 1 3. The process of claim 2, where the molar ratio of the hydrogen phosphite to
2 the iron-containing compound is from about 0.5:1 to about 50:1.
- 1 4. The process of claim 1, where the conjugated diene monomers are 1,3-
2 butadiene, isoprene, 1,3-pentadiene, 1,3-hexadiene, 2,3-dimethyl-1,3-butadiene,
3 2-ethyl-1,3-butadiene, 2-methyl-1,3-pentadiene, 3-methyl-1,3-pentadiene, 4-
4 methyl-1,3-pentadiene, 2,4-hexadiene monomers, or mixtures thereof.
- 1 5. The process of claim 4, where the conjugated diene monomers are 1,3-
2 butadiene monomers.
- 1 6. The process of claim 5, where said step of polymerizing is conducted in the
2 presence of from about 0.01 to about 2 mmol of the iron-containing compound per
3 100 g of the 1,3-butadiene.
- 1 7. The process of claim 5, where the molar ratio of the organoaluminum
2 compound to the iron-containing compound is from about 1:1 to about 100:1.

1 8. The process of claim 7, where the molar ratio of the organoaluminum
2 compound to the iron-containing compound is relatively low.

1 9. The process of claim 7, where the molar ratio of the organoaluminum
2 compound to the iron-containing compound is relatively high.

1 10. The process of claim 7, where the molar ratio of the organoaluminum
2 compound to the iron-containing compound is intermediate.

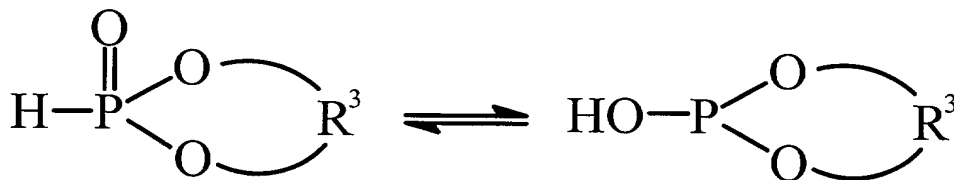
1 11. The process of claim 1, where the iron atom in the iron-containing
2 compound has an oxidation state of 0, +2, +3, or +4.

1 12. The process of claim 1, where the iron-containing compound is an iron
2 carboxylate, iron carbamate, iron dithiocarbamate, iron xanthate, iron
3 β -diketonate, iron alkoxide, iron aryloxide, organoiron compound, or a mixture
4 thereof.

1 13. The process of claim 1, where the hydrogen phosphite is an acyclic
2 hydrogen phosphite defined by the following keto-enol tautomeric structures:



9 or a cyclic hydrogen phosphite defined by the following keto-enol tautomeric
10 structures:



or a mixture thereof, where R^1 and R^2 , which may be the same or different, are mono-valent organic groups, and where R^3 is a divalent organic group.

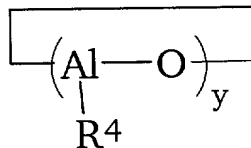
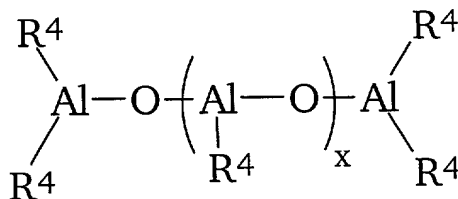
14. The process of claim 13, where R^1 and R^2 are alkyl, cycloalkyl, substituted cycloalkyl, alkenyl, cycloalkenyl, substituted alkenyl, aryl, allyl, substituted aryl, aralkyl, alkaryl, or alkynyl groups, with each group containing up to about 20 carbon atoms, and where R^3 is an alkylene, cycloalkylene, substituted alkylene, substituted cycloalkylene, alkenylene, cycloalkenylene, substituted alkenylene, substituted cycloalkenylene, arylene, or substituted arylene group, with each group containing up to about 20 carbon atoms.

15. The process of claim 1, where the organoaluminum compound comprises at least one compound defined by the formula $\text{AlR}_n\text{X}_{3-n}$, where each R, which may be the same or different, is a mono-valent organic group, where each X, which may be the same or different, is a hydrogen atom, a carboxylate group, an alkoxide group, or an aryloxide group, and where n is an integer including 1, 2 or 3.

16. The process of claim 15, where each R is an alkyl, cycloalkyl, substituted cycloalkyl, alkenyl, cycloalkenyl, substituted cycloalkenyl, aryl, allyl, substituted aryl, aralkyl, alkaryl, or alkynyl group, with each group containing up to about 20 carbon atoms, and where each X is a carboxylate group, an alkoxide group, or an aryloxide group, with each group containing up to about 20 carbon atoms.

17. The process of claim 1, where the organoaluminum compound comprises trihydrocarbylaluminum, dihydrocarbylaluminum hydride, hydrocarbylaluminum dihydride, dihydrocarbylaluminum carboxylate, hydrocarbylaluminum bis(carboxylate), dihydrocarbylaluminum alkoxide, hydrocarbylaluminum dialkoxide, dihydrocarbylaluminum aryloxide, hydrocarbylaluminum diaryloxide, or mixtures thereof.

18. The process of claim 1, where the organoaluminum compound comprises an aluminoxane defined by one of the following formulas:



where x is an integer of 1 to about 100, y is an integer of 2 to about 100, and each R⁴, which may be the same or different, is a mono-valent organic group.

19. The process of claim 18, where each R⁴ is an alkyl, cycloalkyl, substituted cycloalkyl, alkenyl, cycloalkenyl, substituted cycloalkenyl, aryl, allyl, substituted aryl, aralkyl, alkaryl, or alkynyl group, with each group containing up to about 20 carbon atoms.

20. A polybutadiene polymer that is prepared by a process comprising the step of:

[illegible]